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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/808,679	03/25/2004	Timothy J. Fuller	D/A1258	6187

27885 7590 09/11/2006

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EXAMINER

WALKE, AMANDA C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 09/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/808,679

Applicant(s)

FULLER ET AL.

Examiner

Amanda C. Walke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5-16 and 20-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 5-16, 20-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/24/2006 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 5-12, 16, 20-27, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Deubzer et al (6,251,313).

Fuller et al disclose photoreceptor including: (a) a substrate; (b) a charge blocking layer comprising a polymer polymerized from at least one monomer including vinylbenzyl alcohol monomer; and (c) at least one imaging layer. After deposition of any electrically conductive ground plane layer, a charge blocking layer 4 can be applied thereto. Electron blocking layers for positively charged photoreceptors permit holes from the imaging surface of the photoreceptor to migrate toward the conductive layer. For negatively charged photoreceptors, any suitable hole

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blocking layer capable of forming a barrier to prevent hole injection from the conductive layer to the opposite photoconductive layer can be utilized.

If a blocking layer is employed, it is preferably positioned over the electrically conductive layer. The term "over," as used herein in connection with many different types of layers, should be understood as not being limited to instances wherein the layers are contiguous. Rather, the term refers to relative placement of the layers and encompasses the inclusion of unspecified intermediate layers.

The blocking layer includes a homopolymer of vinylbenzyl alcohol, a copolymer of vinylbenzyl alcohol and another monomer, or a terpolymer of vinylbenzyl alcohol and two other monomers, and the like. A preferred copolymer is poly(vinylbenzyl alcohol-vinylbenzylacetate). Mixtures of the polymers described herein may be used such as both poly(vinylbenzyl alcohol) and poly(vinylbenzyl alcohol-vinylbenzylacetate). The amount of vinylbenzyl alcohol in the copolymer and terpolymer ranges between about 25 and less than 100 mole percent, and more preferably between about 75 and about 95 mole percent, the balance being the other monomer or monomers such as vinylbenzylacetate. The concentration of hydroxyl groups is believed to provide the necessary conductivity and preferably should be in the range between about 5 and about 7.5 millimoles of hydroxyl group per gram of resin for optimum performance. This value is dependent on the formulation and the amount of gamma-aminopropyltriethoxysilane which is preferably added to the formulation as well. Suitable monomers for the copolymer and the terpolymer with vinylbenzyl alcohol include styrene, substituted styrenes, acrylates, methacrylates, vinyl acetate, vinyl chloride, and the like.

Poly(vinylbenzyl alcohol) is described in Jones, U.S. Pat. No. 3,879,328. The 3,879,328 patent teaches the preparation of vinylbenzyl alcohol from the hydrolysis of vinylbenzyl chloride followed by polymerization to poly(vinylbenzyl alcohol). However, the yields were low (about 5%) because the vinyl benzyl alcohol is formed in low yields from vinyl benzyl chloride (about 25 to 50%) and there is considerable difficulty in separating vinylbenzyl chloride starting material from the products vinyl benzyl alcohol and vinylbenzyl ether. Moreover, the divinylbenzyl ether that forms must be removed from the vinylbenzyl alcohol or crosslinking of the polyvinylbenzyl alcohol takes place with appreciable gel formation.

The present inventors have discovered that poly(vinylbenzyl alcohol) and poly(vinylbenzyl alcohol-vinylbenzyl acetate) can be made from poly(vinylbenzyl acetate) which itself was made from the reaction of commercially available poly(vinylbenzyl chloride) with sodium acetate. Poly(vinylbenzyl acetate) can also be made from vinylbenzyl acetate by free radical polymerization. Poly(vinylbenzyl acetate) is then hydrolyzed or reduced to form poly(vinylbenzyl alcohol). Partial hydrolysis or reduction of poly(vinylbenzyl acetate) produces copolymers of poly(vinylbenzyl alcohol-vinylbenzyl acetate).

Poly(vinylbenzyl alcohol), with a glass transition temperature of 136.degree. C., and the copolymers of poly(vinylbenzyl alcohol-vinylbenzyl acetate) are useful as thick undercoat layers in photoreceptors either by themselves or with gamma-aminopropyltrialkoxysilane, where alkyl is typically methyl or ethyl.

Poly(vinylbenzyl chloride) was obtained from Aldrich or Scientific Polymer Products, Ontario, N.Y., and has a weight average molecular weight (Mw) of approximately 50,000. Because the polymer is typically prepared by the free radical polymerization of vinylbenzyl

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chloride, the polydispersity (the ratio of M_w to M_n , the number average molecular weight) is typically between 3 and 6. The poly(vinylbenzyl chloride) is reacted with sodium acetate in polar aprotic solvents such as N,N-dimethylacetamide, N,N-dimethylformamide, N-methylpyrrolidinone, dimethylsulfoxide, and the like, at 100.degree. C. and is quantitatively converted to poly(vinylbenzyl acetate) within 16 hours. Poly(vinylbenzyl acetate), with a glass transition temperature of 38.degree. C., is then selectively reduced to poly(vinylbenzyl alcohol) with a 1 molar solution of borane-tetrahydrofuran complex, available from Aldrich. Because 1 mole of borane reduces between 1 and 1.5 moles of benzyl acetate groups on the copolymer (depending on the purity of the poly(vinylbenzyl acetate) and the reaction conditions used), it is possible to precisely control and tailor the number of alcohol groups in the poly(vinylbenzyl alcohol) and the poly(vinylbenzyl alcohol-vinylbenzyl acetate) copolymers formed. Polymers produced with more 77 mole % benzyl alcohol groups are soluble in methanol, ethanol, propanol and Dowanol. Polymers with less than 77 mole % benzyl alcohol groups are soluble in tetrahydrofuran and alcohol-tetrahydrofuran mixtures. All are insoluble in water. Poly(vinylbenzyl alcohol) is insoluble in methylene chloride and tetrahydrofuran. It can be solubilized in these solvents by adding some alcohol. The molecular weights of the products produced are between 30,000 and 50,000 (weight average molecular weight).

EXAMPLE 2

Materials. Poly(vinylbenzyl chloride), catalog number M311, was obtained from Scientific Polymer Products, Ontario, N.Y., and had a weight average molecular weight M_w of about 50,000. Sodium acetate and anhydrous N,N-dimethylacetamide were obtained from Aldrich Chemical Co. Methanol and methylene chloride were obtained from Fisher Scientific.

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Preparation of Poly(Vinylbenzyl Acetate). Poly(vinylbenzyl chloride) (200 grams) in N,N-dimethylacetamide (4-liters, 3,800 grams) were heated using a silicone oil bath at 200.degree. F. for 24 hours in a 5-liter, 3-neck flask under argon equipped with a mechanical stirrer, reflux condenser, argon inlet, and stopper. The resultant solution was decanted off and separated from the salts that crystallized out on cooling and was added to water at a ratio of 25 mL of polymer solution for every 1 liter of water using a Waring blender that was speed controlled with a variable transformer (Variac). The precipitated polymer was collected by filtration, washed with water and then with methanol (2 gallons). The aggregated lump that formed was vacuum dried to yield poly(vinylbenzyl acetate) with a glass transition temperature (T_g) of 38.degree. C. The lump was broken with a hammer and pulverized to a fine powder with a Waring blender. Although the conversion of chloromethyl groups to acetoxy methyl groups was 100% as determined using ¹H NMR spectrometry, the recovered yield of poly(vinylbenzyl acetate) was only about 50% from poly(vinylbenzyl chloride).

EXAMPLE 3

Preparation of Poly(Vinylbenzyl Alcohol). Poly(vinylbenzyl acetate) (100 g, from Example 2) in anhydrous tetrahydrofuran (Aldrich, 1000 grams) was treated with 1-molar borane-tetrahydrofuran complex in tetrahydrofuran (Aldrich, 707.7 grams) and was heated at reflux for 2.5 hours in a 3-liter, 3-neck round-bottom flask equipped with a reflux condenser, mechanical stirrer, argon inlet and rubber septum. A gel formed which dispersed upon stirring. After cooling to 25.degree. C., methanol was cautiously added and vigorous out gassing took place. A clear polymer solution formed that was added to water at a ratio of 25 mL of polymer solution for every 1 liter of water using a Waring blender controlled with a variable transformer

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(Variac). The precipitated polymer was collected by filtration, washed with water, and then was vacuum dried. The polymer was then washed with methylene chloride or was reprecipitated from ethanol or methanol into methylene chloride and then was vacuum dried. The conversion of benzyl acetate groups to benzyl alcohol groups was quantitative as determined by ^1H NMR spectrometry. The recovered yield of poly(vinylbenzyl alcohol) with T_g of 136.degree. C. was about 50% from poly(vinylbenzyl acetate).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a basic catalyst, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the basic catalyst is a quaternary ammonium salt.

Deubzer et al disclose that conventional basic catalysts in any hydrolysis reaction include aminosilanes, compounds liberating ammonia as a result of hydrolysis, such as divinyltetramethyldisilazane, hexamethyldisilazane, organic amine compounds, such as n-hexylamine, triethylamine, diethylamine, tributylamine, piperidine and diazabicyclooctane, organic hydroxides, in particular quaternary hydrocarbon ammonium hydroxides, such as tetramethylammonium hydroxide, tetrabutylammonium hydroxide and trimethylbenzylammonium hydroxide, and inorganic hydroxides, such as sodium hydroxide, lithium hydroxide and potassium hydroxide, and a mixture of the above mentioned compounds.

As cited above, the reference employs THF as a solvent in the reaction mixture, thus meeting the limitations of the instant claims.

Given the teaching so the reference that conventional basic catalysts include tetrabutylammonium hydroxide and trimethylbenzylammonium hydroxide, it would have been

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obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the catalysts taught by Deubzer et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

3. Claims 1, 5-14, 16, 20-22, and 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Pinschmidt, Jr. et al (6,391,992).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a solvent, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the solvent is sodium methoxide.

Pinschmidt, Jr. et al discloses that the hydrolysis reaction from vinylacetate polymers to vinylalcohol polymers is conducted in the presence of a solvent/ catalyst. Such compounds include sodium hydroxide and/or methoxide (also well known solvents in the art).

Given the teaching so the reference that conventional basic catalysts/solvents include sodium hydroxide and/or methoxide, it would have been obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the catalysts/solvents taught by Pinschmidt, Jr. et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

4. Claims 1, 5-12, 16, 20-22, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Sato et al (5,710,211).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a solvent, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the solvent is pyridine.

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Sato et al disclose a process for producing vinyl alcohol-type polymers and teaches that suitable bases/solvents suitable for use in such processes include pyridine.

Given the teaching so the reference that conventional basic compounds/solvents include pyridine, it would have been obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the bases/solvents taught by Sato et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

Response to Arguments


5. Applicant's arguments filed 8/24/2006 have been fully considered but they are not persuasive. . Applicant has again argued that the Fuller et al reference failed to teach the use of a basic catalyst in its hydrolysis reaction. Fuller does not specifically state that a basic catalyst is preferred, however, employs a catalyst known in the art to function in a hydrolysis reaction and is not limited thereto. While applicant argues that there is no motivation to combine the teachings of the secondary references with those of the primary reference (Fuller), the examiner maintains her position as the secondary references teach that it is conventional and advantageous for a basic catalyst to be included in such a reaction. While the borane complex is a type of catalyst, these references teach that there are other known and used catalysts for the same type of reaction, therefore one of ordinary skill in the art would have been motivated to add a basic catalyst as taught by the secondary references to increase the yield of the desired product. While the reference uses the borane complex, it is not limited thereto, thus the rejection is maintained.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C. Walke whose telephone number is 571-272-1337. The examiner can normally be reached on M-R 5:30-4.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Amanda C Walke
Primary Examiner
Art Unit 1752

ACW
September 3, 2006